

AMENDMENTS TO THE CLAIMS

1. (Previously Presented) An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the device comprising:

 a motion compensation vector acquisition unit operable to acquire a motion compensation vector of a coded block that forms the coded image signal by decoding the coded image signal; and

 an interpolation frame generation unit operable to generate:

 the interpolation frame in accordance with at least a motion vector of an image block that forms an image frame by using the motion compensation vector of the coded block as the motion vector of the image block;

 the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

 the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

2. (Previously Presented) An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image

signal that is coded by motion compensation, the device comprising:

- a motion compensation vector acquisition unit operable to acquire motion compensation vectors of coded blocks that form the coded image signal by decoding the coded image signal;

- a motion vector detection unit operable to detect at least a motion vector between a base frame and a reference frame, and operable to detect the motion vector of an image block forming the base frame in an area of the reference frame that is determined in accordance with the motion compensation vectors; and

- an interpolation frame generation unit operable to generate:

- the interpolation frame in accordance with the detected motion vector;

- the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

- the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

3. (Previously Presented) An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the device comprising:

- an image signal information acquisition unit operable to acquire image signal information

of the coded image signal;

a motion vector detection unit operable to partially select at least an image block among the entire image blocks that form a base frame and to detect a motion vector of the partially selected image block between the base frame and a reference frame; and

an interpolation frame generation unit operable to generate:

the interpolation frame in accordance with the image signal information and the motion vector;

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

4. (Withdrawn) The interpolation frame generation device according to claim 3, wherein

the image signal information includes a motion compensation vector or a coding mode of a coded block that forms the coded image signal, and

the partially selected image block is an image block that is determined to be stationary from the image signal information or an image block that is decided to have a movement having low correlation with adjacent image blocks from the image signal information.

5. (Previously Presented) The interpolation frame generation device according to claim 3, wherein

the image signal information includes a coding mode of a coded block that forms the coded image signal, and

the partially selected image block is an intra block.

6-12. (Canceled)

13. (Previously Presented) An interpolation frame generation device for generating an interpolation frame for interpolating image frames, the device comprising:

a generation process ability decision unit operable to decide generation process ability for generating the interpolation frame; and

an interpolation frame generation unit operable to generate:

the interpolation frame in accordance with a decision of the generation process ability decision unit;

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display image order, based upon a motion

vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

14. (Previously Presented) The interpolation frame generation device according to claim 13, wherein

the interpolation frame generation unit is operable to change a number of interpolation frames in accordance with a decision of the generation process ability decision unit.

15. (Previously Presented) The interpolation frame generation device according to claim 13, wherein

the interpolation frame generation unit is operable to change a number of image blocks that form an image frame in which the motion vectors are detected in accordance with a decision of the generation process ability decision unit.

16. (Previously Presented) The interpolation frame generation device according to claim 13, wherein

the interpolation frame generation unit is operable to change a range in which a motion vector of an image block that forms an image frame is detected in accordance with a decision of the generation process ability decision unit.

17. (Previously Presented) The interpolation frame generation device according to claim 13, wherein

the generation process ability decision unit is operable to decide an attribution of an image signal made of the image frame.

18-21. (Canceled)

22. (Previously Presented) An interpolation frame generation device for generating an interpolation frame for interpolating image frames, the device comprising:

a motion vector detection unit operable to detect motion vectors by utilizing a plurality of first image frames that are located either before or after the interpolation frame in the display order; and

an interpolation frame generation unit operable to generate:

the interpolation frame in accordance with the motion vectors;

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

23. (Previously Presented) The interpolation frame generation device according to claim 22, wherein

the plurality of first image frames are located on one side of the interpolation frame in the

display order and include a plurality of base frames that serve as bases for detecting the motion vectors;

at least one second image frame being located on another side of the interpolation frame in the display order that includes a reference frame that serves as an object for detecting the motion vectors; and

the motion vector detection unit is operable to detect the motion vectors between the base frames and the reference frame.

24. (Previously Presented) The interpolation frame generation device according to claim 22, wherein

the plurality of first image frames are located on one side of the interpolation frame in the display order and include a plurality of reference frames that serve as references for detecting the motion vectors;

one or a plurality of second image frames are located on another side of the interpolation frame in the display order and include a base frame that serves as a base for detecting the motion vectors; and

the motion vector detection unit is operable to detect the motion vectors between the base frame and the reference frames.

25. (Previously Presented) The interpolation frame generation device according to claim 22, wherein

the plurality of first image frames includes a base frame that serves as a base for detecting the motion vectors and a reference frame that serves as an object for detecting the motion

vectors; and

the motion vector detection unit is operable to detect the motion vectors between the base frame and the reference frame.

26. (Previously Presented) The interpolation frame generation device according to claim 22, wherein

the motion vector detection unit is operable to detect a first motion vector between a first base frame that serves as a base for detecting the first motion vector and a first reference frame that is located before the first base frame in the display order, and is operable to detect a second motion vector between a second base frame that serves as a base for detecting the second motion vector and a second reference frame that is located after the second base frame in the display order, and

the interpolation frame generation unit is operable to generate the interpolation frame in accordance with the first motion vector and the second motion vector.

27. (Previously Presented) The interpolation frame generation device according to claim 22, wherein:

the motion vectors include a motion vector for generating an interpolation block that forms the interpolation frame, and is detected from a base pixel area that forms a base frame that serves as a base for detecting the motion vector and a reference pixel area that forms a reference frame that serves as an object for detecting the motion vector;

the position of the reference pixel area in the reference frame is defined as a position indicated by a vector that is obtained by internal division or external division of the vector that is

connected between the position of the base pixel area in the base frame and the position of the interpolation block in the interpolation frame; and

the interpolation frame generation unit is operable to generate the interpolation frame by filling with the reference pixel area based on the motion vector, and for a pixel area that cannot be filled with the reference pixel area, the interpolation frame generation unit is operable to generate the interpolation frame by filling with a pixel area of the base frame or the reference frame.

28-32. (Canceled)

33. (Currently Amended) An interpolation frame generation method, which is used with an interpolation frame generation device, for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the method comprising:

acquiring image signal information of the coded image signal;

partially selecting at least an image block among the entire image blocks that form a base frame and detecting a motion vector of the partially selected image block between the base frame and a reference frame; ~~and~~

generating the interpolation frame in accordance with the image signal information and the motion vector;

generating the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation

frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and
generating the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

34-35. (Canceled)

36. (Currently Amended) An interpolation frame generation method, which is used with an interpolation frame generation device, for generating an interpolation frame for interpolating image frames, the method comprising:

deciding the generation process ability for generating the interpolation frame; and
generating the interpolation frame in accordance with a decision from said deciding the generation process ability,

wherein said generating the interpolation frame generates:

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector

detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

37. (Canceled)

38. (Currently Amended) An interpolation frame generation method, which is used with an interpolation frame generation device, for generating an interpolation frame for interpolating image frames, the method comprising:

detecting motion vectors by utilizing a plurality of first image frames that are located either before or after the interpolation frame in the display order; and

generating the interpolation frame in accordance with the motion vectors, wherein said generating the interpolation frame generates:

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

39. (Canceled)

40. (Currently Amended) An interpolation frame generation computer program recorded on a computer-readable recording medium for performing an interpolation frame generation method, which is used for an interpolation frame generation device, for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation by using a computer,

the interpolation frame generation program for causing the computer to execute the interpolation frame generation method comprising:

acquiring image signal information of the coded image signal;

partially selecting at least an image block among the entire image blocks that form a base frame and for detecting a motion vector of the partially selected image block between the base frame and a reference frame; and

generating the interpolation frame in accordance with the image signal information and the motion vector, wherein said generating the interpolation frame generates:

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

41-42. (Canceled)

43. (Currently Amended) An interpolation frame generation computer program recorded on a computer-readable recording medium for performing an interpolation frame generation method, which is used for an interpolation frame generation device, for generating an interpolation frame for interpolating image frames by using a computer,

the interpolation frame generation program for causing the computer to execute the interpolation frame generation method comprising:

deciding generation process ability for generating the interpolation frame; and

generating the interpolation frame in accordance with a decision in said deciding generation process ability, wherein said generating the interpolation frame generates:

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

44. (Canceled)

45. (Currently Amended) An interpolation frame generation computer program recorded on a computer-readable recording medium for performing an interpolation frame generation method, which is used for an interpolation frame generation device, for generating an interpolation frame for interpolating image frames by using a computer,

the interpolation frame generation program for causing the computer to execute the interpolation frame generation method comprising:

detecting motion vectors by utilizing a plurality of first image frames that are located either before or after the interpolation frame in the display order; and

generating the interpolation frame in accordance with the motion vectors,

wherein said generating the interpolation frame generates:

the interpolation frame for an image block that is not included in one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally further from the interpolation frame than the one image frame, wherein the image frame located temporally further from the interpolation frame includes the image block that is not included in the one image frame; and

the interpolation frame for an image block that is included in at least one image frame located sequentially after the interpolation frame in a display order, based upon a motion vector detected by using an image frame that is located temporally closest to the interpolation frame among at least one image frame including the image block.

46. (Canceled)

47. (Previously Presented) The interpolation frame generation device according to claim 1, wherein the motion vector is detected for a reference frame that is in a same scene as a base frame.

48. (Previously Presented) The interpolation frame generation device according to claim 1, wherein the motion vector is corrected by a smoothing filter.

49. (Previously Presented) The interpolation frame generation device according to claim 2, wherein the motion vector is detected for the reference frame that is in a same scene as the base frame.

50. (Previously Presented) The interpolation frame generation device according to claim 2, wherein the motion vector is corrected by a smoothing filter.

51. (Previously Presented) The interpolation frame generation device according to claim 27, wherein the motion vector is detected for the reference frame that is in a same scene as the base frame.

52. (Previously Presented) The interpolation frame generation device according to claim 27, wherein the motion vector is corrected by a smoothing filter.